

Irving Oil

Ultra Low Sulfur Diesel - ULSD

Ultra Low Sulfur Kerosene - ULSK



Outline



- *Irving Diesels Today*
- *Legislation*
- *Impact of Legislation*
- *Supply Chain*
- *ULSD Properties*
- *Summary*

Diesels Today



Low Sulfur Diesel

- ***“On-Road” (off road)***
- ***Sulfur = Maximum 500 ppm or 0.05 wt%***

High Sulfur Distillate

- ***“Furnace or Heat” (off road)***
- ***Sulfur = Maximum 3000 ppm or 0.3 wt%***

Legislation



- ***USEPA and Environmental Agency in Canada are aligned***
- ***Reduced emissions (NO_x , particulate, hydrocarbon) for 2007 model year need exhaust after treatment, this in turn needs very low sulfur fuel.***
- ***Sulfur “Poisons” the catalysts in the after treatment equipment.***
- ***On -Road Diesel (ULSD)***
 - June 1st, 2006 - 15 ppm at refinery***
 - September 1st, 2006 - 15 ppm at terminal***
 - October 15th, 2006 - 15 ppm at customer***

Legislation



- ***Off -Road Diesel***

- ***2007 – 500 ppm LSD (June 1st)***
- ***2010 – 15 ppm ULSD***
- ***2012 – 15 ppm Rail & Marine (pending)***

- ***Heating Oil***

- ***Probability that sulfur limits will be reduced.***
- ***Timing & sulfur level still to be determined.***
- ***Environmental benefits are small.***

Impact of Legislation



- **Old**

On-road - 500 ppm

Heating Oil - 3000 ppm

Heat sulfur is 6 x greater than On-road sulfur

- **New**

On-road - 15 ppm

Heating Oil - 3000 ppm

Heat sulfur is 200 x greater than On-road sulfur

Contamination is a concern

Contamination Example



- *Volume of Heat @ 3000 ppm required to put*

100 barrels of ULSD @ 12 ppm off spec = **4.3 gallons**

- *Volume of Heat @ 3000 ppm required to put*

100 barrels of ULSD @ 14 ppm off spec = **1.5 gallons**

- *Volume of Heat @ 3000 ppm required to put*

100 barrels of ULSD @ 15PPM off spec = **0.0 gallons**

Contamination is a concern !!

Supply Chain



Refinery



- *Over \$100 million being invested to produce ULSD*
- *Refinery is producing 15 ppm On-road diesel & 3000 ppm heating oil . Currently available at Searsport, Portsmouth and Revere. Portland is close*
- *Will no longer produce a 500 ppm Diesel product*
- *2 refinery process units will produce ULSD components*

Refinery



- **Hydro De-Sulphurizer (HDS)**

- Expand unit from 32,000 BPD to 40,000 BPD in 2005
- Desulfurizes light diesel

- **Hydrocracker (HCU)**

- Desulphurizes 32,000 BPD heavy diesel and improves winter cold properties.

- **New Hydrogen Recovery Facility**

- Provides hydrogen required for HDS & HCU ; Online 2005

- **Tankfield**

- New lines, product drying facilities & ULSD blender being constructed
- New shipping line from refinery to ESJ dock to prevent contamination









Shipping



- ***No physical changes to ships are required***
- ***Existing procedures for washing ships compartments tightened***
- ***Four new ships arriving between 2005 / 2006 designed with ULSD in mind***



Marine Terminals



- ***Each terminal visited by Irving Project team***
- ***Determined modifications required to provide segregation between ULSD & Heating Oil while discharging ship.***
- ***Existing low sulphur tanks converted to ULSD service***

Truck Transportation



- ***Preventing contamination between ULSD & Heating Oil is key***
- ***Irving Project team reviewed options with fleet manager***
- ***Options :***
 - 1) ***Dedicate some trucks for ULSD***
 - 2) ***Modify some trucks to segregate products***
 - 3) ***Install “Drain dry” facility at loading point***
- ***Path forward included all options***



Retail Station Tanks

- ***15 ppm ULSD required by October 15th,2006***
- ***Existing Low Sulfur tanks converted to ULSD***
- ***Tanks marketed to low level & refilled with ULSD could require***
 - ***4 – 8 turns to be on spec***
- ***Some tanks may require cleaning***
- ***Labeling requirement***

ULSD Properties



- ***The only specification that changes is sulfur.***
- ***All other specifications remain the same. (Cetane, pour pt, cloud pt, gravity, etc)***
- ***Lubricity additive may/will be required at the refinery***

On Road Supplier Summary

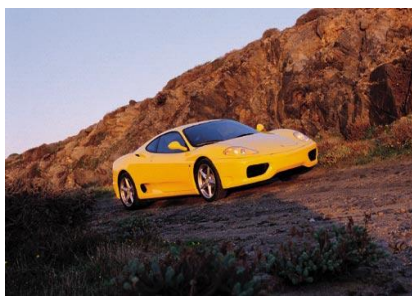


- ***ULSD at refinery by June 1st,2006.***
- ***ULSD at retail sites by October 15th,2006.***
- ***Small amounts of high sulfur heat will put ULSD off spec.***
- ***Refinery projects to produce ULSD are completed***
- ***No modifications to ships are required.***
- ***Terminal modifications made for segregation while unloading ships***
- ***Options to prevent contamination on truck is segregation***
- ***No modifications to CR / Customer tanks are anticipated.***

OFF ROAD CONSUMER SUMMARY



- ***2007 – 500 ppm LSD ~ June 1st***
- ***2010 – 15 ppm ULSD***
- ***Lubricity spec is met by the refiners ~ Irving exceeds it***
- ***In 2007 the price will be higher ~ if you can find the product***
- ***Contamination can be an issue***
- ***What is cetane all about?***



**You would never think of putting 87 octane gasoline in the Ferrari.
Why put a lower cetane diesel fuel in your Peterbilt or heating oil in your CAT?**



Irving *PLUS* Diesel Fuel

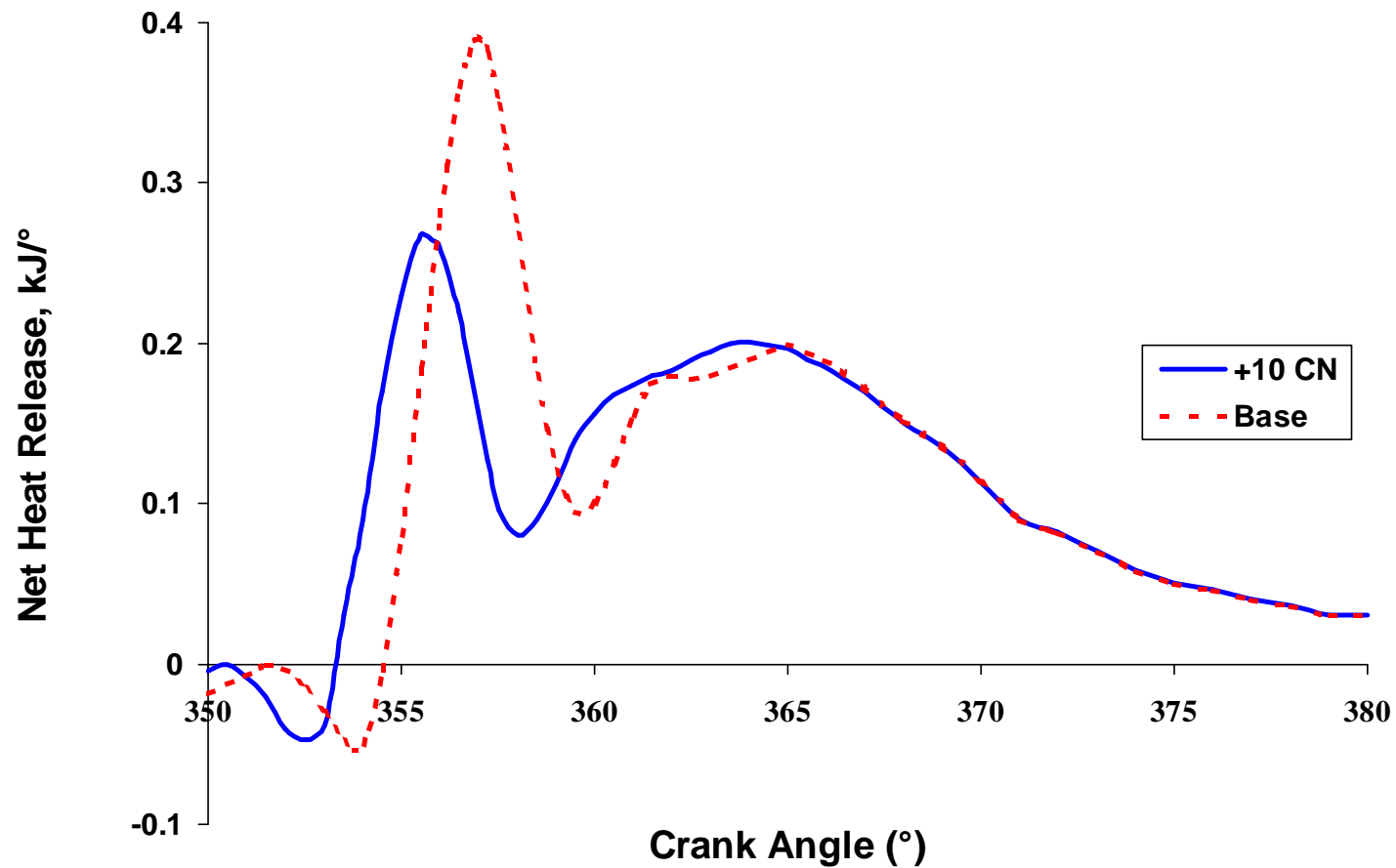
“Making the Best even Better”™

What is Cetane Number?



- Cetane number (CN) is a measurement of **IGNITION DELAY**
 - how long it takes from the time the fuel is injected until the combustion process begins
 - the higher the CN, the shorter the delay
- Cetane number is **NOT**:
 - a measurement of fuel economy
 - a measurement of power
 - a measurement of “combustion smoothness”

The Effect of Ignition Delay



- Fuel economy improvement 2% to 12%
 - Do the math ($\$2.50 \times 2\% = 5 \text{ cents/gal!}$)
- Reduced emissions
- Improved cold start
- Reduced warm-up
- Reduced misfire
- Improved combustion
- Reduced white smoke upon start-up
- Reduced noise